REMARKS

Informalities

In the Office Action mailed on November 8, 2005, the Examiner rejected claims 1-2, 6-7, 10-12, and 14-15 as being indefinite. The independent claim of this group (i.e., claim 1) included trademarks within its literal terms. Claim 1 is canceled by this amendment document.

Claims 14 and 15 were rejected as failing to comply with the written description requirement. These claims are also canceled by this amendment document.

Prior Art Rejections

In the above-identified Office Action, the Examiner rejected claim 1 as being obvious in view of the combination of Murray (US 2004/0051048) and Hurst (US 4,471,223). The Examiner stated that Murray disclosed most of the elements of claim 1, except for an opaque, flexible protective sheath; however, Hurst used an opaque, flexible protective sheath.

Claim 1 is being canceled herein. Note that a new claim 16 is now the independent claim that essentially replaces claim 1. The term "opaque, flexible protective sheath" is not an element of claim 16.

Discussion of the cited art

Murray

Murray discloses a neutron detector, which comprises a Teflon tube that is filled with a "liquid cocktail" which both absorbs neutrons and has scintillation characteristics when neutrons impact the liquid cocktail. Murray essentially acts as a Geiger counter, in that it merely counts the quantity of neutrons impacting its liquid cocktail; it does not determine the level of a product within a container. In other words, it acts as a *neutron radioactive particle* "level" detector; but *not* as a *product* level detector for a product material being held in a container or a tank.

The Examiner cited Murray as disclosing the elements of claim 1, except for an opaque, flexible protective sheath surrounding the flexible tube. Applicants are cancelling claim 1 in this

Amendment, so this reasoning is now less important than before.

Murray is still important prior art, but as noted above, it basically is a Geiger counter that detects the quantity of neutrons "in the air." It is not used as a product level detector, and does not have a physical structure that would allow it to be used for that purpose. Although Murray uses a liquid material as a scintillator, this liquid is not attempting to detect gamma rays, or other wavelengths of ionizing radiation. Instead, the purpose of this liquid is to detect the neutrons (which are radioactive *particles*, not photons) and also to absorb these neutrons. This is a very specialized liquid; Murray refers to it as a "liquid cocktail," to set this apart from other types of scintillator compounds.

While Murray states that "the tube can be modified to cover large apertured areas," he also states that, "in such implementations a wavelength shifter is employed to convert light emitted to another wavelength giving a multiplier effect necessary for long light guides." *See*, Summary, in paragraph **[0004]**. All of this information points to Murray's invention having a very different purpose than that of the present invention. The only real commonality is the use of a liquid scintillating material, but they are very different materials.

Applicants have added a new independent claim 16, in which the liquid scintillation material "is sensitive to detecting ionizing radiation, but is not substantially sensitive to detecting radioactive particles." Applicants' liquid scintillation material would not work as a neutron detector, and thus it is very different than the "liquid cocktail" used in Murray. In addition, the photodetection unit of Applicants' claim 16 determines a "level of product within said container," which is a function that the *Murray* invention does *not* perform.

Hurst

Hurst discloses a product level detector (or a product "interface" level detector) that uses a solid scintillating material to receive gamma radiation (a form of ionizing radiation). Hurst does not use a liquid scintillation element at all; instead Hurst uses solid crystals as the scintillator element. *See*, column 2, lines 6-12. While Hurst mentions "scintillating fibres" as a form of plastic scintillators (in column 2, lines 11-12), Hurst is not referring here to the "optical fibres" that he

discusses at other places in his patent. Instead, the optical fibers of Hurst are used to carry the scintillating photons from the actual gamma-ray scintillator to the "measuring instrument." (*See*, column 2, lines 30-34.)

The Examiner discusses Hurst (in the latest Office Action) as teaching the use of a "protective sheath for optical fibers and scintillating fibers" for use in a level sensing gauge (in combination with a source of nuclear radiation). Claim 16 does not include a protective sheath, so this aspect of Hurst is essentially moot with regard to this new claim. (Note that a sheath *is* included in a dependent claim.)

In an earlier Office Action (mailed on July 12, 2005) the Examiner stated that Hurst expressly disclosed the use of "optical fibers that scintillate as the gamma-ray scintillator." (*See* page 9, second paragraph.) This simply is not true. Hurst uses gamma-ray scintillators **5** that produce scintillating photons that are then transmitted along the optical fibers **6** to the remote detector **8**. Hurst does not use the "optical fibres" for any scintillation characteristics. (The plastic fibers in column 2, lines 11-12 are referred to as "scintillating fibres," not optical fibers.)

Even if there is prior art that uses scintillating fiber optic cables with (or without) sheaths that detect gamma radiation (*see*, US 6,198,103), such prior art is much different than a flexible tube (with or without a sheath) that contains a liquid scintillating compound, such as that recited in claim 16. Any optical *fibers* that have scintillating properties are nevertheless *solid* structures, flexible or otherwise, and they do not contain a liquid such as that included in claim 16. Therefore, any such prior art structure is very different than that of claim 16.

Leonardi-Cattolica

The Examiner noted that "industrial level sensing gauges using neutrons are well known in the art" on page 11 of the above-identified Office Action, citing US 4,870,278, to Leonardi-Cattolica et al. (in response to a previous amendment in which Applicants stated that the use of a neutron emitting isotope in an industrial level sensing gauge would be inappropriate). However, it should be noted that Leonardi-Cattolica uses *multiple neutron sources* to perform such level detecting functions. Moreover, the Leonardi-Cattolica invention does not use a liquid scintillator medium; in

fact, Leonardi-Cattolica does not discuss scintillators at all.

Leonardi-Cattolica basically operates in the opposite sense of the present invention:

(1) In Leonardi-Cattolica there are *multiple* neutron sources at various heights near a vessel having the level of its fluid contents determined. In the preferred embodiment, there is a neutron source at each of the ends of the detector apparatus, and there is a single neutron backscatter detector. Thus there are two neutron radioactive particle sources that are positioned directly adjacent to the detector apparatus itself. When the vessel is *empty*, the neutron detection rate is at a *minimum*; when the vessel is full, the neutron detection rate is at a maximum, due to the increased number of neutrons that are moderated by the hydrogen-bearing fluid in the vessel. (*See*, the Summary, column 4, lines 56-64.)

(2) In the present invention, there is a *single* ionizing radiation source located at a spaced-apart distance from the fluid-filled flexible tube that contains the scintillating liquid. In other words, the radiation source is not adjacent to the tube of scintillating liquid. The tube of scintillating liquid is in photonic communication with a photodetector element (e.g., at one end of the tube). When the container (or tank) is *empty* of product material, the received (and detected) radiation is at a *maximum*; when the container/tank is full of product material, the received (and detected) radiation is at a minimum.

Thus the present invention and Leonardi-Cattolica invention are quite different from one another.

Discussion of Present Invention, Claim 16

Claim 16 includes an elongated flexible tubular member with two closed ends, in which the tubular member has an interior region that is substantially filled with a "liquid scintillation material which is sensitive to detecting ionizing radiation, but is not substantially sensitive to detecting radioactive particles." This liquid material is not at all like that used in the Murray invention, which specifically is sensitive to detecting radioactive particles (i.e., neutrons). Hurst has no *liquid* scintillation material of any kind, but uses some form of solid crystal or fibers.

Claim 16 also has a "photodetection unit operably positioned relative to said first end closure member to detect scintillating photons generated in said liquid scintillation material." This photodetection unit is used to determine a level of product within a separate container (e.g., a tank), based on a quantity of said detected scintillating photons. This element is different than Murray, which does not act as a product level detector. This element is also different than Hurst, which does not detect scintillating photons that are generated in a *liquid* scintillation material (even though Hurst does detect scintillating photons that are generated in a solid medium).

Arguments

In the rejections up to now, the Examiner has relied mainly on Murray and Hurst. These are admittedly relevant prior art. Murray does use a liquid scintillator material, and Murray does detect radioactive particles by use of that liquid scintillator material. However, Murray's device does not work as a "product" level detector, for determining the physical level of a product within a container of some type. Instead, Murray merely counts neutrons, whatever the physical shape or space these neutrons arrive from; Murray's device is mainly portable, and has no particular spatial relationship with a container and, so configured, it would not be able to determine a product level of anything.

The present claimed invention (of new claim 16) uses a liquid scintillator material that is sensitive to *detecting ionizing radiation*, but is *not sensitive to detecting radioactive particles*. This is significantly different than Murray. Moreover, the present invention of claim 16 is physically (spatially) located at a surface of a container, and has an elongated tubular member that allows it to determine a level of a product material within that container. This, Murray does not do, as noted above.

The Hurst invention does not use a liquid scintillator, but rather uses a solid crystal scintillator compound. The scintillating photons are then coupled to a fiber optic cable, and then transmitted therethrough to a remote measuring detector. Even though this fiber optic cable would likely be flexible, it nevertheless is not a (flexible) tube filled with a liquid scintillator material, so it is unlike the present invention of claim 16. Yes, Hurst detects gamma radiation, but still it does so using a *solid* scintillating material. Even if the fiber optic cable itself acted as a scintillating

material, it would yet be a *solid* scintillating material.

In the above-identified Office Action, the Examiner used Hurst mainly to show that the use of a sheath over a tubular construction is not nonobvious (in combination with Murray). Applicants are not going to dispute that position now, although Applicants are not necessarily going to concede that point of view. Instead, Applicants are now directing claim 16 to other aspects of the present invention, as noted above, and Hurst does not teach or suggest those aspects.

If Murray and Hurst were to be technically combined, the logical result would be difficult to arrive at.

Their *dissimilarities* are:

(1) Murray detects radioactive particles; Hurst detects gamma rays.

(2) Murray uses a liquid scintillator; Hurst uses a solid scintillator.

(3) Murray acts as a Geiger counter of sorts, not as a container's product level detector; Hurst determines the level of an interface (of a product) within a tank or other container.

On the other hand, their *similarities* are:

(a) Murray uses a (Teflon) tube; Hurst uses a tubular sheath (over fiber optic cables).

(b) Murray's tube perhaps could be flexible; Hurst's tube probably would be flexible.

Of the above "similarities," claim 16 only recites the "flexibility" aspect. The "sheath" aspect is not in claim 16, although it is found in a dependent claim.

Of the above "dissimilarities," claim 16 of the present invention detects ionizing radiation, not radioactive particles (thus, more like Hurst), uses a liquid scintillator material (thus, more like Murray), and detects a product level in a container (thus, more like Hurst). But these characteristics of the cited prior art are all *opposites* from one another in that very art. It is not a fair statement to take three opposite characteristics from two different prior art references, and then say that claim 16 would be obvious in view of that art. There is no suggestion, and certainly no teaching, in those references to do these "opposite" things in some kind of combination. Only the present invention is providing any guidance as to how these might be combined.

The mere fact that a worker in the art could rearrange the parts of a reference device to meet the terms of the claims is not by itself sufficient to support a finding of obviousness. The prior art must provide a motivation or reason for the worker in the art, without the benefit of Applicants' specification, to make the necessary changes in the reference device. *See, Ex parte Chicago Rawhide Mfg. Co.*, U.S.P.Q. 351, 353 (Bd. Pat. App. & Inter. 1984). *See also*, MPEP 2144.04 VI. *C*. Based on this reasoning, Applicants respectfully submit that claim 16 would not be obvious in view of Murray in combination with Hurst.

Conclusion

Applicants have canceled claim 1, which was rejected in view of Murray and Hurst. Applicants have added a new independent claim 16, and have presented reasoning as to why claim 16 should not be considered obvious in view of this art. The other dependent claims have been re-numbered (where necessary) to depend from claim 16, instead of claim 1. There are three other independent claims still in this case that have been allowed (claims 3, 8, and 9).

There should be no fees associated with this amendment. However, the Director of Patents and Trademarks is hereby authorized to charge any underpayment of fees incurred due to this amendment to Deposit Account No. 50-2116.

Applicants respectfully request the Examiner to favorably reconsider and allow the pending claims.

Respectfully submitted,

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